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Adhesive for the Production of Cigarette Filters

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(54) Title of the Invention: **Adhesive for the Production of Cigarette Filters**

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SPECIFICATION

1. Title of the Invention

Adhesive for the Production of Cigarette Filters

2. Claims

(1) An adhesive for the production of cigarette filters, formed by dissolving a cellulose derivative in a mixture comprising 5 to 100% methyl ether expressed by the general formula $CH_3(OCH_2CH_2)_nOR$ (where n = 1 to 6, and R is either H or CH_3) and 95 to 0% glycerol triacetate, wherein said adhesive is used to bond filter fiber material and covering tape.

(2) The adhesive for the production of cigarette filters according to Claim 1, wherein the cellulose derivative is cellulose diacetate.

3. Detailed Description of the Invention

(Field of Industrial Utilization)

The present invention relates to an adhesive for the production of cigarette filters used in bonding between filter materials and covering tapes.

(Prior Art)

The production of cigarette filters comprises opening a filter material, covering the periphery thereof with covering tape, fashioning the resulting assembly into the shape of a rod, and subsequently cutting the rods to a desired length. In these instances, cellulose diacetate fiber tow is normally used in the filter material, while paper is used as the covering tape. The cellulose diacetate fiber tow and paper are continuously supplied to a winding machine in long bolts, and bundled together using an endless tape known as garniture tape. The bundling procedure takes place after an interfiber adhesive plasticizer has been applied to the cellulose diacetate fibers. The circumference is wrapped with a covering tape while being fashioned into a cylindrical shape. Two types of adhesive are supplied immediately before the wrapping procedure, and a bond is made both between the filter material and the covering tape, and between both ends of the covering tape. The shaping and bonding are completed by means of heating after the wrapping procedure, and the resulting filter rods are cut to a fixed length. These rods, whose length equates to that of several cigarette filter tips, are further shortened in the subsequent step; i.e., the rods are cut to the length of the tip, and are connected to the smokeable part of the cigarette to yield a filter cigarette. However, a poor quality product will be obtained if the bonding between the covering tapes and between the covering tape and the filter material is incomplete, due to peeling, detachment, deformation, or other such occurrences.

The speed with which filters and cigarettes are produced has increased in recent years, with an extremely short period of time now being required to apply the adhesive, to perform the subsequent heating and drying steps, and to complete the bonding. Filters containing granular additives such as activated carbon or whey proteins are also prepared, and tips comprising such filters are constituted by two or more of such components, so little contact area exists between the covering tape and each component, thereby requiring a high adhesive strength per unit surface area.

Conventionally used adhesives include polyvinyl acetate emulsions, starch paste, and EVA hot-melt resins. Among such adhesives, hot-melt resins in particular require a very short time elapsing from application and pressure bonding to the completion of bonding by means of cooling, and are therefore the only materials used to bond together covering tapes that have a small bonding area. At present, there are no other alternatives to such adhesives.

On the other hand, adhesive waste causes products of low quality to be produced by accumulating (especially on the cutter) and peeling off to contaminate the end product when such adhesives are used during continuous operation. Therefore, a need has existed for an adhesive that would not generate any adhesive waste and be able to withstand long-period operation even if a certain amount of adhesive strength is compromised when filter materials and covering tapes having large bonding areas are bonded together.

In response to such demands, solutions formed by dissolving cellulose diacetate in a plasticizer that dissolves cellulose diacetate are used exclusively for bonding together covering tapes and filter materials, and are particularly used when the filter material comprises a cellulose diacetate fiber bundle. Estrobond C, which is marketed by Eastman Kodak Company, is one such adhesive, and glycerol triacetate (triacetin) is used as a plasticizer. The generation of adhesive waste is never observed with adhesives formed from cellulose diacetate dissolved in glycerol triacetate; however, such adhesives have a low adhesive strength and a relatively slow bonding rate. Accordingly, problems arise when they are used either in high-speed production, or in dual-filter or additive-containing filter production, due to their insufficient adhesive strength and bonding rate, rendering them unable to meet the aforementioned demands satisfactorily.

(Object of the Invention)

It is an object of the present invention to provide an adhesive for the production of cigarette filters that is used in bonding filter materials to covering tapes, has an exceptional bonding rate and adhesive strength, and functions to prevent adhesive waste from being generated during continuous operation.

(Constitution of the Invention)

The present invention relates to an adhesive for the production of cigarette filters formed by dissolving a cellulose derivative in a mixture comprising 5 to 100% methyl ether expressed by the general formula

$$CH_3\left(OCH_2CH_2\right)_n OR$$

(where n = 1 to 6, and R is either H or CH_3) and 95 to 0% glycerol triacetate, wherein the adhesive is used to bond filter fiber material and covering tape.

The methyl ether used in the present invention refers to a mono- or dimethyl ether of a long-chain ethylene glycol that may range from ethylene glycol to hexamethylene glycol. Examples of the cellulose derivative that dissolves in the methyl ether include cellulose diacetate, cellulose propionate, and cellulose acetate butyrate, with cellulose diacetate being especially preferred.

Examples of filter fiber materials include cellulose diacetate fiber tow having a 37.3 to 42.3 degree of acetylation (analytical value), a crimp count of 10 to 60 crimps per 25 mm, a monofilament fineness of 1 to 16 denier, and a tow fineness of 10,000 to 100,000 denier. Paper is used for the covering tape.

The preferred amount of cellulose derivative included in the adhesive of the present invention is 0.5 to 25%. If the cellulose derivative content is 0.5% or less, adhesive strength will suffer, while if the content is 25% or higher, the solution viscosity will become excessively high, workability will suffer, and the bonding rate will decrease.

The adhesive of the present invention, which is used in bonding the filter fiber material and covering tape in the cigarette filter manufacturing step, generates no adhesive waste, and has a higher adhesive strength and bonding rate than current adhesives in which glycerol triacetate is employed. Accordingly, the adhesive may be supplied for use in high-speed production, dual-filter production, or other applications.

The usage of the cigarette filter bonding composition of the present invention shall be described below with reference to working examples; however, the present invention shall not be construed as being limited to these examples.

The methods of measurement employed in the examples are described below.

(1) Solution viscosity

The solution viscosity of the adhesive composition was measured using a B-type viscometer. The measurements were obtained at a temperature of 30°C. The solution viscosity is expressed in centipoise (CP).

(2) Adhesive strength/bonding rate

The adhesive strength was determined by observing the state of adhesion between the acetate fibers and covering tape of wound filter rods. "A" indicates high adhesive strength, "B" weak adhesive strength, and "C" a lack of adhesion, with the evaluations being made after one day had elapsed.

For the bonding rate, "A" indicates bonding had been achieved 30 min after the wound filter rods had been cut open (when the adhesive strength was evaluated to be of an "A" level), "B" indicates bonding had been achieved after one hour, "C" indicates bonding had been achieved after one day, and "O" indicates no bonding had occurred.

Working Example 1

A Hauni KDF-II was used as a winding machine, and a Hauni AF-I as a tow treating apparatus. The acetate fiber tow had a filament fineness of 3 denier and a total fineness of 36,000 denier. The tow had approximately 26 crimps per 25 mm, and filter rods that were 24.70 mm in circumference, 102 mm in length, and 0.65 g in weight were wound at a linear speed of 400 m/min.

A wide applicator was used to apply the adhesive on virtually the entire surface of the covering tape except in areas where parts of the covering tape were bonded together. The

adhesive composition used in the test is shown in Table 1. The cellulose used was cellulose diacetate having a 55% degree of acetylation and an average degree of polymerization of 140.

A good bonding rate and adhesive strength was obtained with the adhesive between the filter fibers and the covering tapes on the filter rods that were wound in Working Examples 1 through 6, and the adhesive composition used in the present invention performed satisfactorily.

Comparative Example 1

Filter rods that were 24.70 mm in circumference, 102 mm in length, and 0.65 g in weight were wound in the same manner as performed in Working Example 1. The adhesive composition used in the winding procedure is shown in Table 1 together with the composition of Working Example 1.

Table 1

	Adhesive composition	Mixing ratio (wt%)	Solution viscosity (CP)	Adhesive strength	Bonding rate
Working Example 1	Diethylene glycol dimethyl ether Cellulose diacetate	92.5 7.5	3,300	A	A
Working Example 2	Triethylene glycol monomethyl ether Cellulose diacetate	97.5 2.5	150	A	A
Working Example 3	Hexaethylene glycol monomethyl ether Cellulose diacetate	98.5 1.5	120	A	A
Working Example 4	Ethylene glycol monomethyl ether Cellulose diacetate	80.0 20.0	21,000	A	A
Comparative Example 1	Triethylene glycol monomethyl ether	100	8	C	D[1]
Comparative Example 2	Glycerol triacetate Cellulose diacetate	97.5 2.5	600	A	C

[1] [Translator's note: no explanation is provided for a grade of "D" in evaluating the bonding rate in the description of the measurement methods, although a grade of "O" is indeed provided and described. Accordingly, a typographical error has presumably been made either in the table or in the relevant description, though the latter is more likely, given the logical order of the other (higher) grades (i.e., A, B, C etc.).]

Table 2

	Adhesive composition	Mixing ratio (wt%)	Solution viscosity (CP)	Adhesive strength	Bonding rate
Working Example 5	Diethylene glycol monomethyl ether Cellulose diacetate	95.0 5.0	600	A	A
Working Example 6	Triethylene glycol monomethyl ether Cellulose diacetate	95.0 5.0	1,400	A	A

No bonding occurred in Comparative Example 1, and a long period of time was required for bonding to occur in Comparative Example 2.

Working Example 2

The same winding machine used in Working Example 1 was used, except that an activated carbon supplying device was installed between the bundling unit and the plasticizer applicator used on the fiber tow. The same acetate fiber tow used in Working Example 1 and coconut shell activated carbon with a 42- to 82-mesh particle size were used. The wound filter rods were 24.3 mm in circumference and 120 mm in length, 0.40 g of activated carbon was added, and the total rod weight was 1.30 g.

The adhesive compositions used in the test and the attendant results are shown in Table 2. The strength and bonding rate of the adhesive used between the filter fibers and the covering tape were good in the filter rods wound in Working Examples 6 and 7, regardless of whether activated carbon had been added, and the adhesive composition used in the present invention performed satisfactorily.

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